

CHAPTER 11

SITE PRODUCTIVITY

In forestry, site productivity is defined as the capacity of a site to produce a given forest product, usually wood. Actual productivity is generally measured in terms of gross volume of bole wood per acre per year over the normal rotation. This volume is not strictly a function of the site alone because it also depends on species composition of the stand, length of rotation, stand density, and history of treatment of the site. Therefore, no single value for site productivity can be expected for any given species on all sites.

Accurate estimates of productivity can only be obtained from permanent long-term sample plot data. Unfortunately such data are not widely available in the United States.

The site index, or the height of free-growing trees of a given species at a given age, has been shown to be more closely related to the capacity of a given site to produce wood of that species than has any other single measure. For this reason, foresters in the United States have long used site index as the only estimator of site productivity. Indiscriminate use of this method, however, is not justified for reasons too numerous to deal with here (see Manserud, 1984; Kotar and Coffman, 1982).

In many cases, site index reflects the intensity of management (or lack thereof) rather than inherent site potential. Many current stands are the result of earlier exploitation practices which were not conducive to optimal stand development.

Studies in Michigan have shown that habitat type more consistently predicts site potential for red pine than does the site index (Kotar and Coffman, 1982). This is because potential height growth is often not achieved due to interference from competing vegetation, particularly during the seedling and sapling stages of growth. Under these conditions site index is under estimated.

While site index can be a useful tool if used properly, combining it with the habitat type classification increases the chances of making the best management decisions.

Although the values for volume production of various species on different habitat types are not yet available, the *Field guide to forest habitat types of northern Wisconsin* (Kotar, et al., 1988) provides a ranking of habitat types in terms of performance of major tree species.

Site index is further described below:

A. Definition

Site index is the height attainable by the average dominant and co-dominant trees in relatively pure, even-aged, and well-stocked stands at the age of 50 years. It reflects the combined effect of different environmental factors and is used as a measure of stand productivity.

B. Application

Site index is to be used for determining the ideal year of harvest of all even-age managed timber types on public and private lands. The actual year of recommended or programmed harvest will reflect site index in combination with management objective and stand condition.

Site index of even-aged species over 25 feet in height is determined by using the standard height over age method. With stands of white pine or red pine under 25 feet in height, site index is determined by the 5-year intercept method.

To evaluate site index, a number of sample trees in a stand should be measured for total height and age. Only dominant trees should be used. Total age is used for all species except where indicated for specific species (see the timber type chapters in this Handbook for site index curves for various species).

In estimating site index, the following limitations should be considered:

- The index will not apply to any stands whose development, because of climatic or soil peculiarities, is expected to be widely different from the average trend portrayed by the curves. The curves assume that percent deviation of observed height above or below the central trend remains constant throughout the life of the stand.
- The site index cannot be properly evaluated in stands where dominant and co-dominant trees have been affected by past suppression.
- The curves should not be applied to extremely dense or very open stands where stagnation or excessive crown development, respectively, is observed.

Site index curves for a variety of conifers and hardwoods have been compiled (Carmean et al., 1989).

References

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